

Computer Generated Forces Behavior Representation Interchange System

Lee W. Lacy, Dynamics Research Corporation



Purpose

Identify lessons learned from interchanging CGF behaviors that will help in developing a common representation and interchange system for human behavior representations using SEDRIS concepts



Presentation Outline

- CGF BR XML Research
- Key Concepts From SEDRIS
- Relation of CGF BR XML research to SEDRIS Concepts
- Semantic Web Technology Potential
- Conclusions / Recommendations

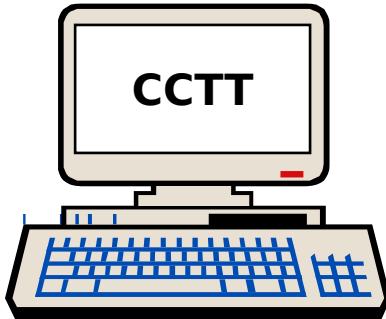


CGF Behaviors

- Computer Generated Forces (CGF) systems simulate units and platforms
- CGF systems operate at a variety of fidelity and resolution levels
- Behaviors historically “hard coded”
- Newer systems represent behaviors in data
- Considerable resources required to develop CGF systems and their associated behaviors
- Similarities and differences exist between representing CGF behaviors and HBR



Current CGF Systems



- Ada Finite State Machines



- Asynchronous Augmented Finite State Machines
(translated into "C" code)

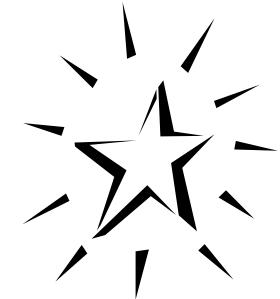


- Behavioral Description Frames
- Fundamental Behaviors (C++ code)

Today's CGF systems are built in a stove-piped manner

eXtensible Markup Language (XML)

- World Wide Web Consortium (W3C) Standard
- Evolved from another metalanguage SGML
- Uses “tags” to markup Unicode (text) data
- Commercial support for standard reduces requirement for custom code
- Individual domains develop languages with specific tag sets



XML has been adopted as an industry standard



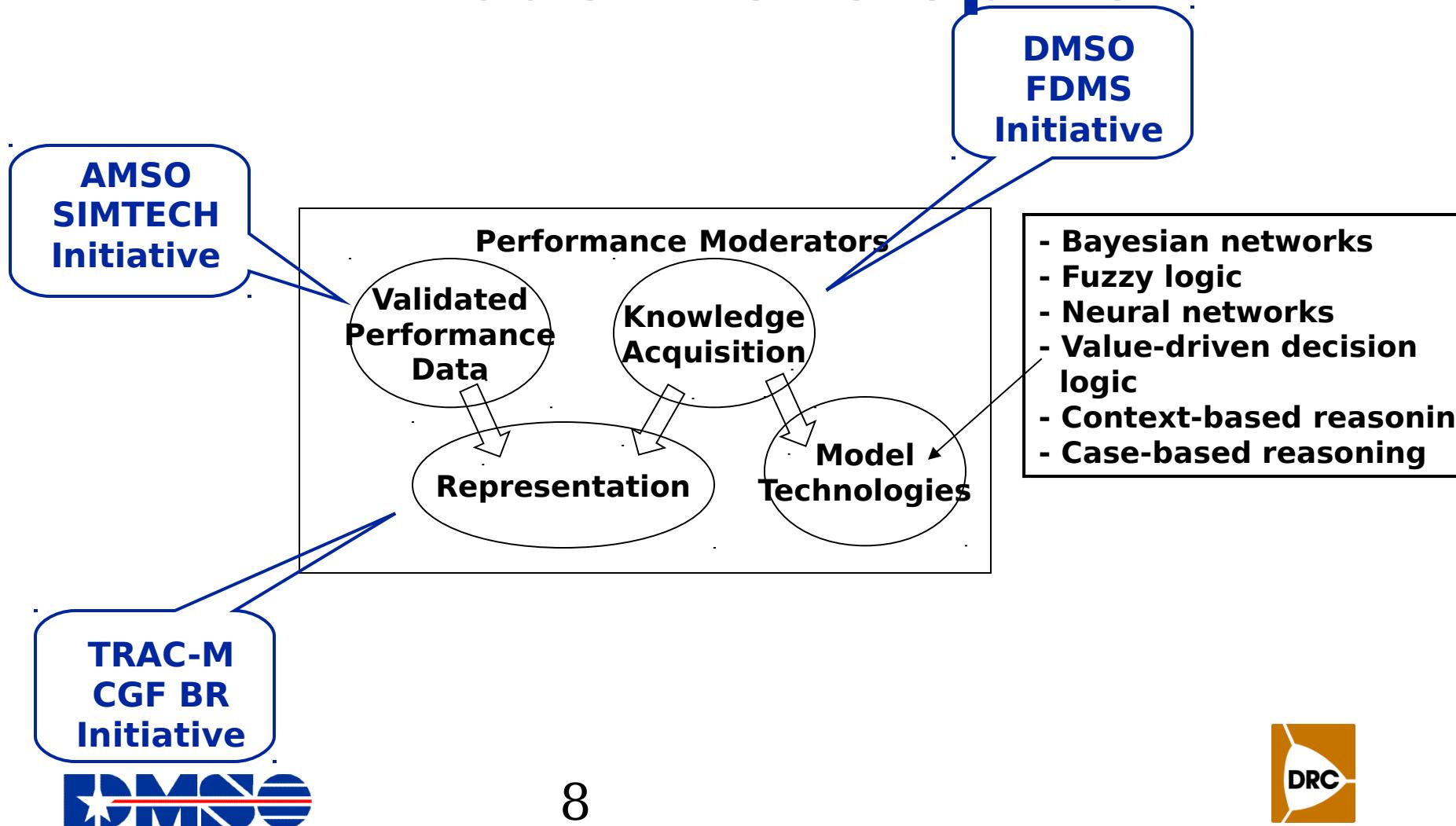
M&S Community use of XML

- HLA Data Interchange Formats (DIFs)
- JSIMS Common Component Workstation Battlespace Schema
- Equipment Characteristics and Performance Data (e.g., AMSO SIMTECH initiative)
- High Level Architecture (HLA) Dynamic Scenario Builder (DSB)
- Combat XXI Scenario Files
- OneSAF Objective System

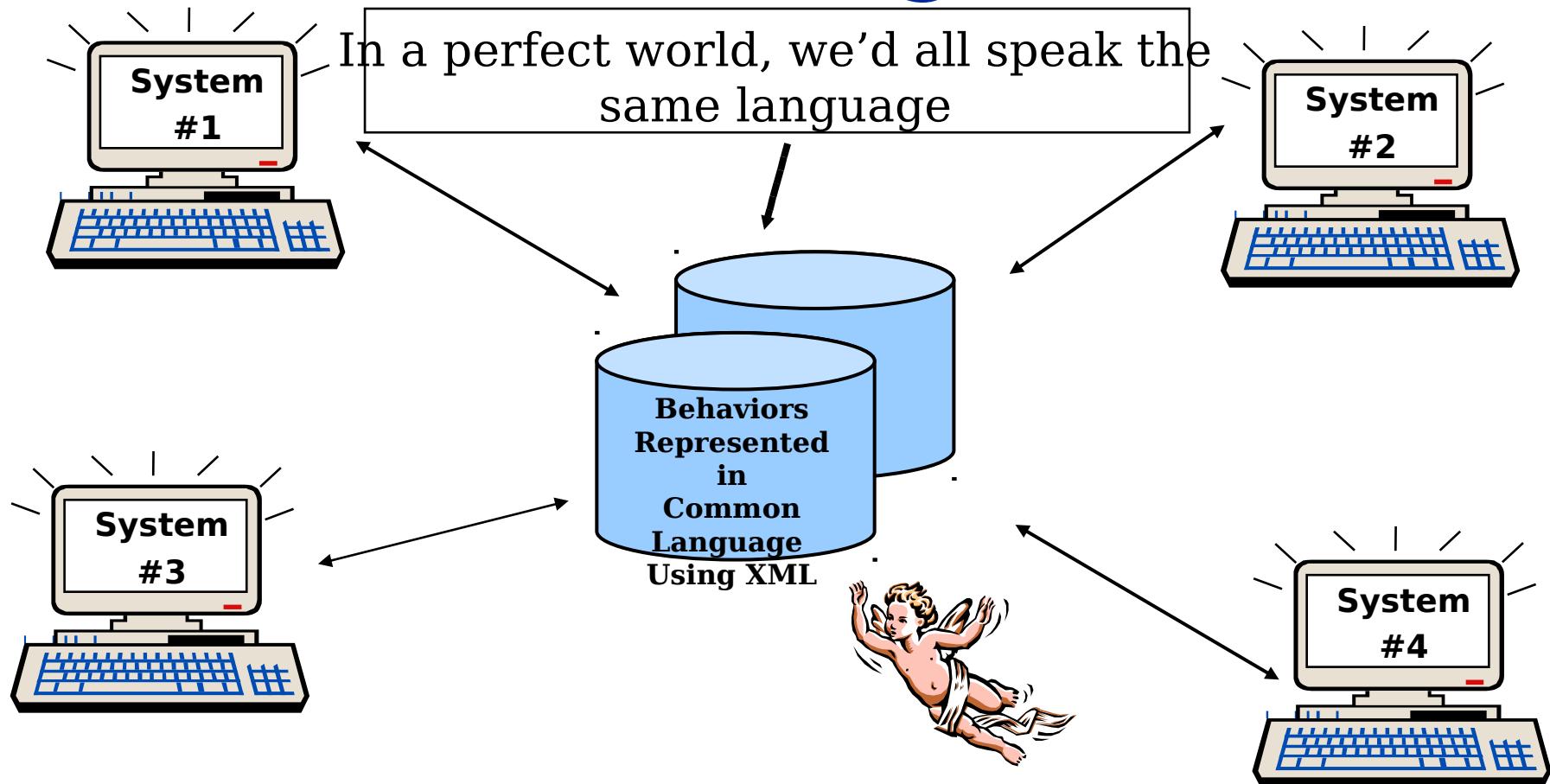
XML integrated in newest DoD simulations and architectures



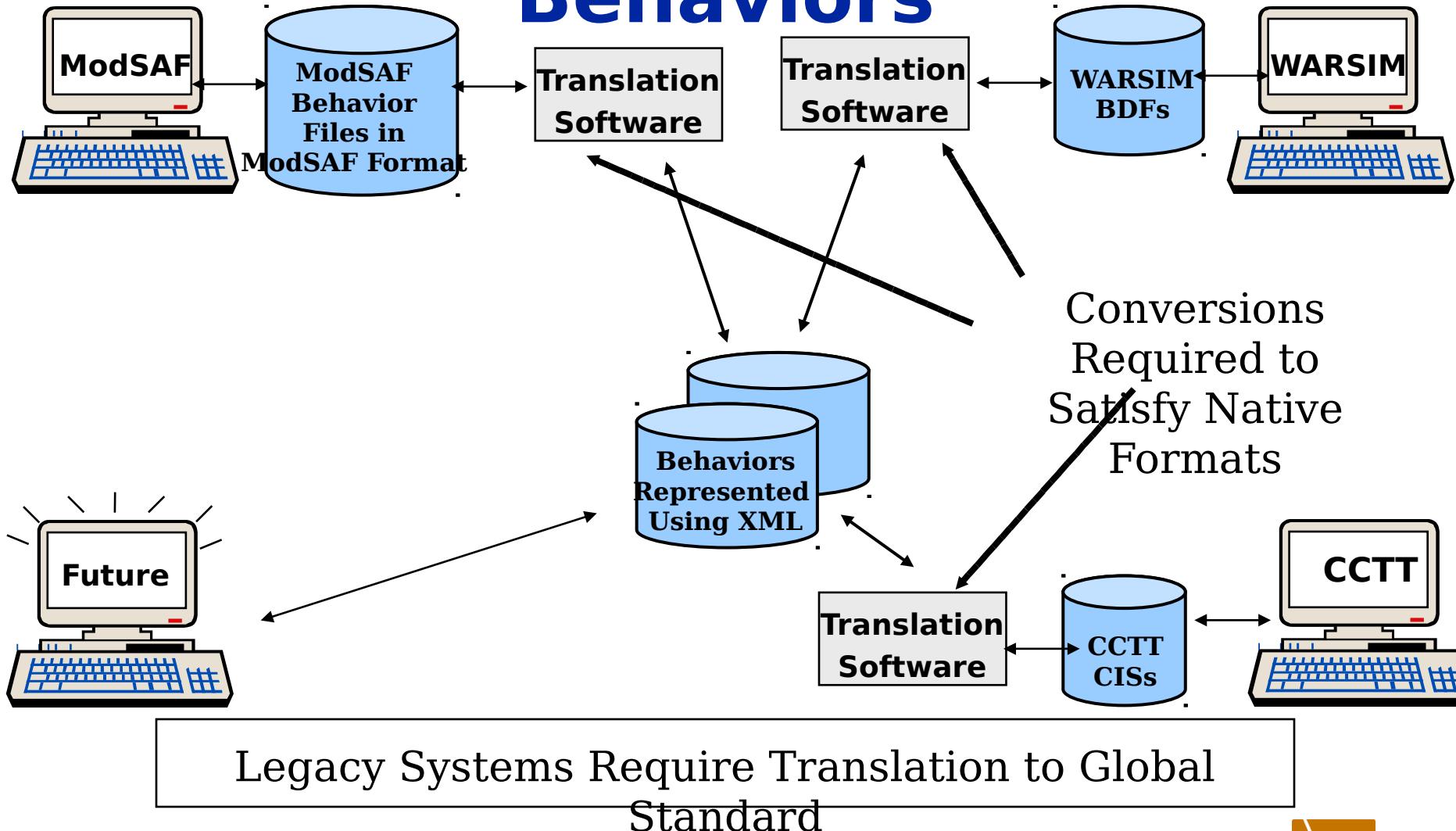
Related XML Work in Context of Framework for HBR Model Development



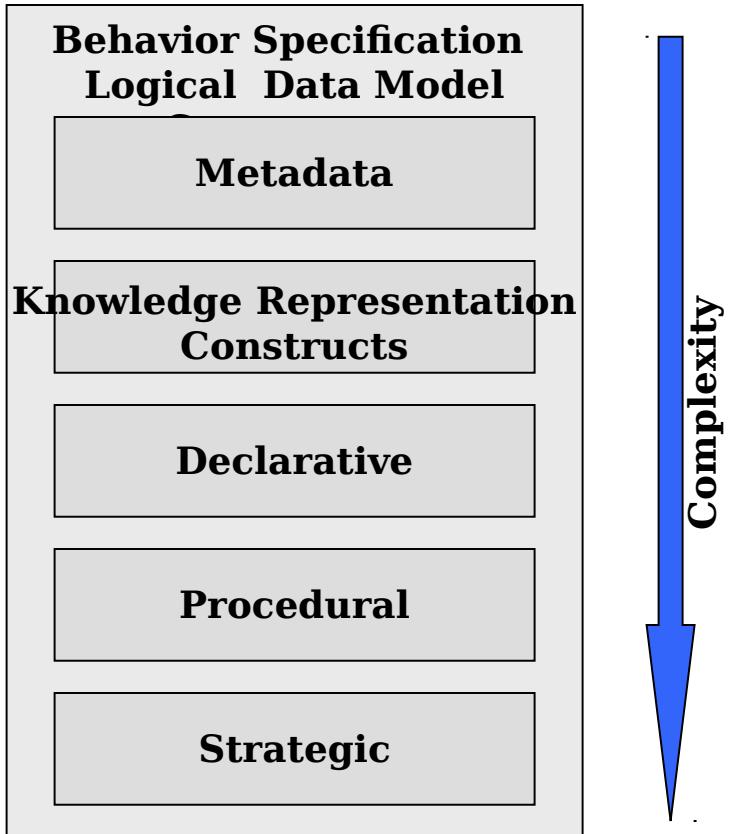
“Perfect World” Behavior Sharing



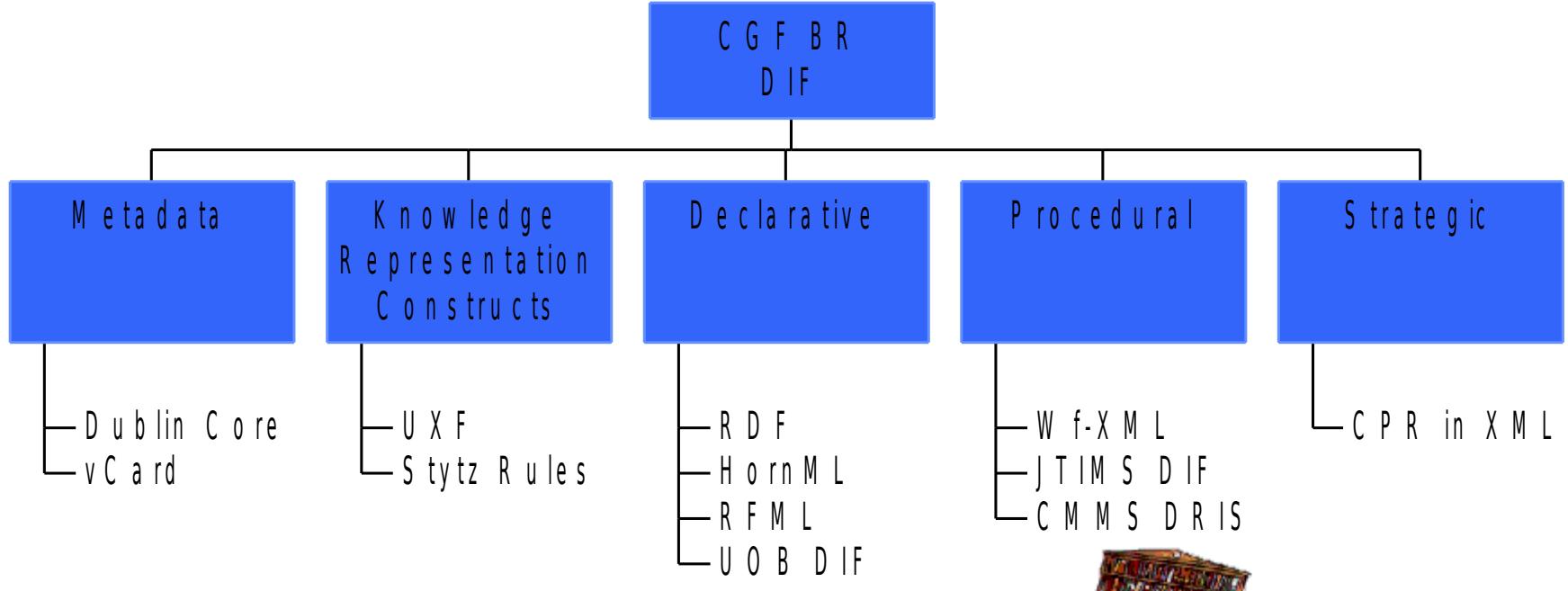
Integrating Legacy System Behaviors



CGF Behavioral Representation Logical Data Model Components



Reusing XML Grammars



Leveraging existing XML
namespaces

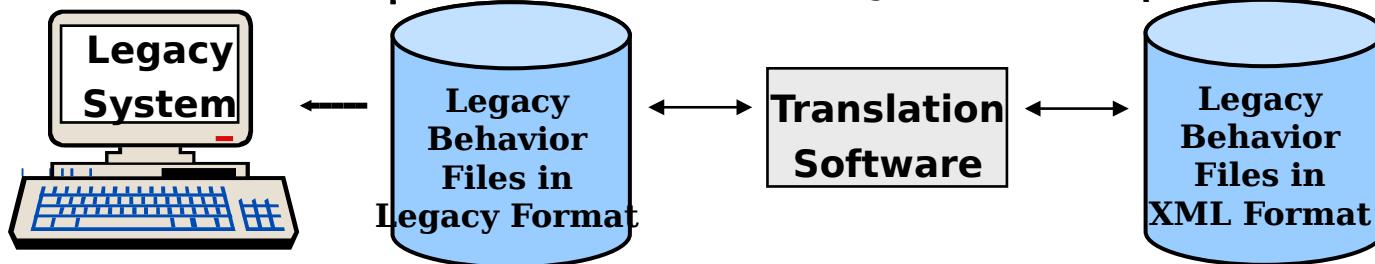


Monster DTD

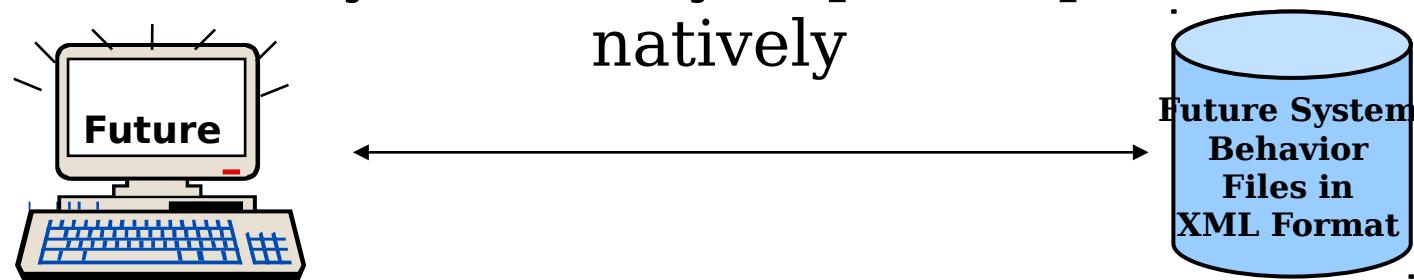
- Impossible to create a single CGF language supporting all possible implementations
- Maintenance nightmare to support large number of data elements
- Each CGF system needs its own XML language
- Sharing CGF behavior representations is really an “integration” problem

Stovepipes using XML

Legacy systems require translation software to import/export XML (solves syntactic problem)



Future systems may import/export XML natively



One Step Closer

eXtensible Style Language

- Originally focused on providing the “format” separated out from the “content” described in XML
- Used to present XML data on a variety of devices/output media
- Extension into XSL Transformations (XSLT) for “transforming” data between XML files with different structures
- Requires mapping



Simplify XSLT Mapping

- Source and Destination both XML files describing CGF behaviors (different structures describing different CGF systems)
- Divide into common sections (Metadata, KR constructs, declarative, procedural, strategic)
- Use common namespaces (e.g., vCard, Dublin Core)
- Employ XSLT technology to declare mappings



SEDRIS Key Concepts

- Separate representation of data from interchange of data sets
 - Data Representation Model (DRM) should contain “primitives” used to describe a real world thing, rather than a taxonomy / model of real world
 - Interchange includes:
 - API
 - Format
 - Associated tools and utilities

Comparison of Key Concepts

SEDRIS

Data Representation Model described using UML And OMT

API developed by SEDRIS community

Binary SEDRIS Transmittal File developed by SEDRIS community

Tools and Utilities developed by SEDRIS community

CGF XML Research

Data model described using IDEF1X

XML Document Object Model provides API (standard) supported by COTS

XML Interchange files described using XML DTDs and/or XML Schemas (standard leveraged)

Tools and Utilities can easily be developed by leveraging COTS



Semantic Web

- Marking up content for intelligent agent software
- DARPA Agent Markup Language (DAML)
- Could be used to represent behaviors
- Could be used as source of information for CGF agents



Conclusions

- Wide divergence exists in legacy approaches / representations
- Global / Common language that satisfies all past and future systems is unrealistic
- Challenge is two parts: syntactic and semantic
- Use XML representations to solve syntactic problem
- Use XSLT to support mappings for semantic solution
- Leverage Existing Namespaces to simplify mappings



CHRIS Recommendations

- Develop Data Representation Model (DRM) that can be used to describe behavior descriptions (not behaviors themselves)
- Resolve subset of supported descriptions (e.g., STDs, neural networks)
- Use XML DTDs and XML Schemas to formalize the serialization of the DRM
- Use XML Document Object Model as API into representations
- Track Semantic Web evolution for eventual migration from XML to Semantic Web representations



Questions?

Lee Lacy

(407) 380-1200 x104

LLacy@DRC.com



22

